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Zaleski⁷ has made, with great care, a number of chemical analyses and mechanical separations of several granites to determine whether or not they are syenites plus quartz; that is, whether or not the chemical limits between which these rock types vary are fixed. His results may be tabulated as follows:

Locality.	SiO ₂ Content.	SiO ₂ of rock—Quartz.
Dannemora,	61.06	54.08
Nigg,	69.84	65.33
Hangö,	71.42	59.46
Baveno,	74.44	41.38

Of these granites only one possesses the silica content of syenite after the quartz has been abstracted from it.

Spurr,⁸ in a bulletin on the iron-bearing rocks of the Mesabi Range in Minnesota, describes a series of fragmental and cherty rocks associated with the ores. One of these, to which he gives the name "taconite," consists of a groundmass of silica, in which are granites of a green substance, regarded by the author as glauconite. These are always more or less altered, yielding siderite, magnetite, hematite, etc. The sideritic phase of this taconite is like the original carbonate of Irving and Van Hise.

In a small collection of specimens from central and western Paraguay, Milch⁹ has recognized quartzites, limestones and phonolites.

GEOLOGY AND PALEONTOLOGY.

Niagara and the Great Lakes.—Another contribution to the history of the Great Lakes is published by F. B. Taylor.¹⁰ It is the eighth of a series and brings the history up to date. In an introduction the author refers to the recent papers of Professor J. W. Spencer and Mr. Warren Upham on the post-glacial history of the Great Lakes in the following language:—

"Prof. Spencer on the one hand levels all the higher abandoned beaches with the sea, and does not distinctly recognize a single ice-

⁷ *Ib.*, XIV, p. 342.

⁸ *Bull. No. X, Geol. and Nat. Hist. Survey of Minn.*

⁹ *Min. u. Petrog. Mitth.*, XIV, p. 383.

¹⁰ *Amer. Journ. Sci. Arts*, 1895.

dammed lake. Mr. Upham, on the other hand, ascribes nearly all submergence to ice-dammed lakes, and admits none as marine except that which is proved by fossils. As often happens in such cases, the probability is that the truth lies between these wide extremes. Ice dams have played an important part, but not to the exclusion of marine submergence even at high levels. On the other hand, marine invasion is not available as an explanation for some of the most important areas of submergence."

Mr. Taylor's views of the subject under discussion are summarized in the following chronological conspectus, taken from the last paper of his series, from which it will be seen that they are of the medium character referred to above :

"As its maximum the great Laurentide glacier covered the whole area of the Great Lakes. By a correlation of the abandoned shore lines, moraines and outlets, and the gorges, recently submerged shores and rivers of this region the following order of events is made out for the post-glacial history of the Great Lakes. They are set down in seven principal stages with transitions or critical stages between.

"1. Glacial, ice-dammed lakes. Outlets at Fort Wayne, Chicago and other places. Beaches correlated with moraines in Ohio. Glacial lakes fall by stages as outlets change on withdrawal of the glacier-dams. Land relatively high in the north but slowly subsiding.

"*First transition*: By withdrawal of glacier the Niagara river is opened and the upper lakes become united.

"II. First Niagara lakes. First epoch of Niagara Falls begins at Lewiston. For a short time glacial Lake Iroquois receives the water from Niagara. Shore lines of lower levels of this glacial lake washed over and obliterated by later marine invasion. Gradual depression of land continues at north, finally opening Nipissing outlet.

"*Second transition*.—First two-outlet climax. Marked by the Algonquin Beach. (Possible subdivision here for Trent river outlet). Gradual northward depression continues. First epoch of Niagara Falls closes at the Whirlpool. Epoch of Erigan Fall begins.

"III. First Lake Algonquin. Outlet eastward over Nipissing pass.

"*Third transition*: Gradual northward depression continues. Nipissing outlet brought down to sea level. Lakes become marine.

"IV. Warren Gulf (rising stage). Marine waters fill the three upper lakes, the Ontario, St. Lawrence, and Winnipeg basins.

"*Fourth transition*: Marine climax. Marked by the Chippewa Beach. Northward depression ceases and gradual elevation begins.

Iroquois and Herman marine beaches made at the same time as the Chippewa. This was probably the climax of the post-glacial warm epoch.

"V. Warren Gulf (falling stage). Gradual northward elevation. Irregular uplifts in the north deforming Chippewa and Algonquin beaches.

"*Fifth transition*: Nipissing outlet raised to sea level. Upper lakes become fresh.

"VI. Second Lake Algonquin. Outlet eastward over Nipissing pass. Probably a small amount of local uplift at outlet in early stage.

"*Sixth Transition*: Second two-outlet climax. Marked by the Nipissing Beach. Epoch of Eriean Fall closes at a point between 40 and 80 rods above the cantilever bridge. Second (present) epoch of Niagara Falls begins.

"VII. Second Niagara lakes (present stage). Lake Superior becomes independent. Great Champlain uplift at the northeast. Formation of St. Clair delta begins and continues to the present time." (Am. Journ. Sci., April, 1895.)

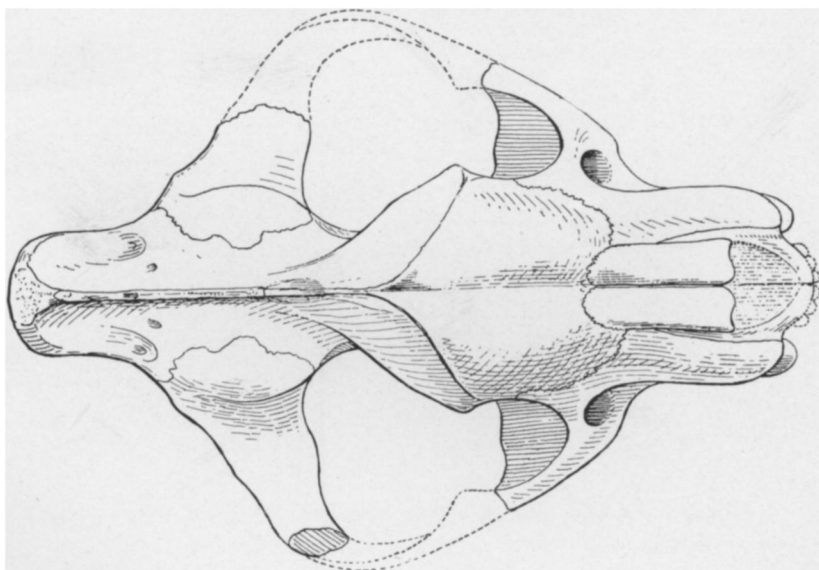
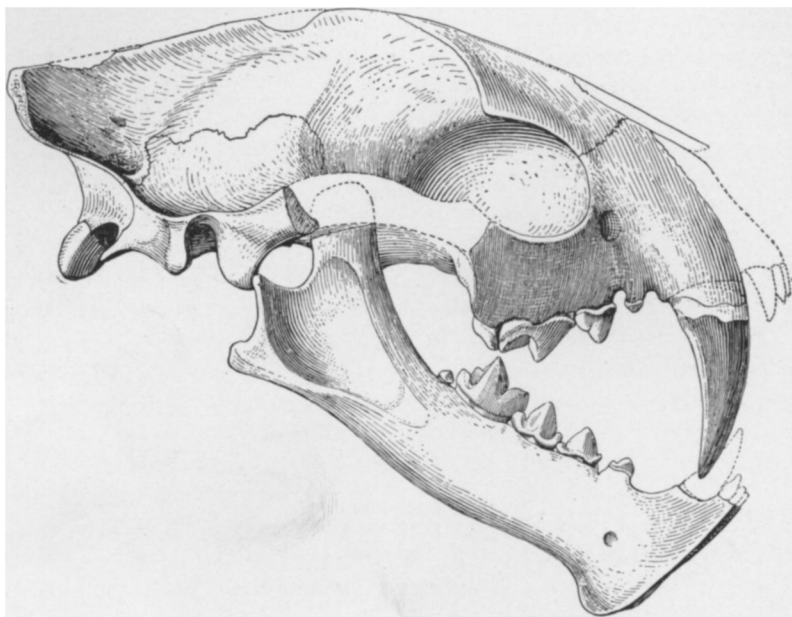
Fossil Insects.—M. Brogniart in a work on fossil insects recently published recognizes 62 genera of cockroaches represented by 137 species, many of which are new, and described for the first time by the author. Among other facts made known is the existence of carboniferous insects having three pairs of wings. Certain other species keep, in the adult form, a larval characteristic, being furnished with respiratory plates on the sides of the abdomen, comparable to those of the larvæ of modern Neuropters.

The modern cockroaches lay their eggs, generally, enclosed in an egg-bearing capsule; the Paleo-species, on the contrary, had an ovipositor and laid their eggs one by one as the grasshoppers do.

The Protolocustides and Paleacridides were jumping Orthopterons insects like the grasshoppers and katydids of the present time, but their posterior wings were as large as the anterior ones and were not folded like a fan. (Bull. Acad. Roy. des Sci. 1895.)

The Phylogeny of the Whalebone Whales.—At a meeting of the American Philosophical Society held May 3d, 1895 Prof. E. D. Cope gave an account of the types of *Mystacoceti* which had been discovered, and which throw considerable light on the probable phylogeny of the suborder. He pointed out that the *Zeuglodon pygmaeus* of

PLATE XXVI.



Dinictis bombifrons, Adams, x $\frac{1}{2}$.

Müller is in cranial characters much like *Mystacoceti* of the genus *Cetotherium*, and that it is probable that the latter were derived from the forms by the loss of their teeth. The structures of the mandibular rami of various species show the transitions from such a form to those of the right whales. Deriving the *Balænidæ* then from a form like that of the new genus *Agorophius* (type *Zeuglodon pygmæus* Müll.), we have a succession of genera in which the gingival groove and dental canal show various stages of roofing, fusion or obliteration. The genera of the *Neocone* beds were defined as follows.

I. Gingival groove distinct from dental canal.

Gingival groove open; *Genus not discovered.*

Gingival groove overroofed; *Siphonocetus* Cope.

II. Dental canal not distinct; gingival groove open.

Gingival tubules wanting; *Ulias* Cope.

Gingival tubules present; *Tretulias* Cope.

III. Gingival groove and dental canal fused.

Common canal roofed, and perforated by gingival tubules;

Cetotherium Brandt.

The type of *Siphonocetus* is *Balæna prisca* Leidy. *S. expansus* Cope, and *S. clarkianus* Cope, sp. nov. belong to it. The type of *Ulias* is *U. moratus* Cope sp. nov. The type of *Tretulias* is *T. buccatus* Cope, sp. nov. To *Cetotherium* are referred *C. pusillum* Cope, *C. crassangulum* Cope sp. nov., *C. polyporum* Cope, and *C. cephalus* Cope. All the species of *Balænidæ* referred to are from the Yorktown (Middle) Neocene beds of Maryland, Virginia and N. Carolina.

Two New Species of *Dinictis* from the White River Beds.

—The primitive saber-toothed cats are already represented in the genus *Dinictis* by three species; *D. felina* Leidy, *D. cyclops* Cope and *D. squalidens* Cope. To these may be added the two species described in this article, *D. fortis* and *D. bombifrons*. With the exception of *D. cyclops* from the John Day Beds of the Lower Miocene, the species are confined to the White River or Oligocene. Until the division of the White River,¹ no account of horizons was taken in collecting, but from the specimens at hand the range of the different species is indicated as follows: *D. fortis*, Titanotherium and Lower Oreodon Beds, *D. bombifrons* Lower Oreodon Beds, *D. felina*, Lower Oreodon to the Protoceras Beds.

¹ Divisions of the White River or Lower Miocene of Dakota, by J. L. Mortman, Bulletin American Museum, Nat. Hist., Vol. V, June 27, 1893.

Diniotis fortis sp. nov.

This species is based upon two specimens in the Princeton Museum, (number 11085 from the upper Titanotherium Beds and number 10933 from the Lower Oreodon Beds) which were collected by Mr. J. B. Hatcher in the summer of 1894. Number 11085, in which the front portion of the skull and the mandibular rami are preserved, is taken as the type specimen. Besides the skull there are present the distal end of the scapula, the humerus, most of the lumbar vertebræ, pelvis, proximal half of the femur, the tibia, astragalus and the bones of one digit. Of specimen 10933 there are portions of the skull showing the typical dentition and in addition to the bones of the type specimen there are the radius, ulna, scapho-lunar and additional foot bones and vertebræ, thus making it possible to give all the distinguishing characters of the species excepting those of the posterior portion of the skull.

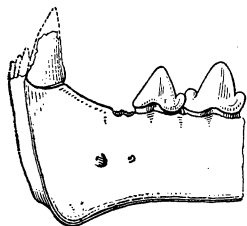


Fig. 1. *Diniotis fortis*, fragment of jaw, $\times \frac{1}{2}$.

Typical characters: The species differs from *D. felina* in that the muzzle is much shorter and broader and the orbital plate of the maxillary is larger and heavier. The differences in dentition are the entire absence of the paraconid of the second premolar, the larger upper canines and the more perpendicular set of the teeth as shown in the lower premolars. The skeleton is larger, the limb bones approaching in proportions those of *Hoplophoneus occidentalis* but with more slender shafts.

The Skull: The fact that the posterior portion is not preserved prevents the description of many important points, but the characters of the anterior portion are distinctive. The nasals are broader than those of *D. felina* and the premaxillaries are heavier and more rounded in their lower portion. The opening of the anterior nares is correspondingly broader. The maxillaries unite with the nasals and premaxillaries so as to form a regularly curved surface, in consequence of which the muzzle presents a rounded appearance. The orbital plate is heavier and extends farther forward, the anterior portion of the malar process of the maxillary being over the posterior root of the third premolar while in *D. felina* it is above the anterior root of the sectorial. This fact also has an important bearing on the shortening of the muzzle. The orbit is wider and the infra-orbital foramen is distinctly larger. The anterior portion of the palate is somewhat broader, otherwise it presents no special characteristics. The horizontal ramus of the mandible

is slightly heavier, the symphysis is broader and the flanges are less accentuated. There is a low rough tuberosity on the inner superior border of the ramus opposite the second molar, similar to that mentioned by Cope as occurring in *H. oreodontis*.

Dentition: In the type specimen the crowns of all the teeth are broken off but the fangs show the dental formula to be that characteristic of the genus, I. $\frac{3}{2}$ C. $\frac{1}{1}$ M. $\frac{1}{2}$. The superior canines are more robust than is indicated by the recorded measurements of *D. felina*. In specimen 10933 from the Lower Oreodon Beds, the crowns of the third and fourth inferior premolars are preserved. They are higher, the para- and meta-conids are less trenchant and the teeth are set more nearly perpendicularly in the jaw than those of the other Nimravidæ. There are no indications of a paraconid on the third premolar.

The fore-limb: The scapula presents a large glenoid cavity to correspond with the large articular surface of the head of the humerus. The neck is stout, the coracoid process is short and heavy, the spine is thick and shows the base of the metacromion. The head of the humerus is large and the greater tuberosity rises above it but slightly. The lesser tuberosity is low and rugose. The bicipital groove is broad and shallow, contrasted with that of *D. felina*, which is narrow and deep. The ulna and radius present no special characteristics excepting their relatively larger proportions. The manus of *D. felina* has not been described but from a specimen at hand it can be seen that it was small and narrow, thus agreeing in character with the pes which is already well known.² The manus of *D. fortis* agrees with these characters but the scapho lunar differs in that the tubercle is set off by a distinct groove.

The hind limbs are very similar in their markings to those of *D. felina* but on the femur the line from the third trochanter to the second is incomplete and the inter-osseous line of the tibia is very sharp and well marked. These characters are present in both specimens and are probably not due to individual variation. The knee joint seems particularly large, since the shafts of the limb bones possess something of the slenderness characteristic of those of *D. felina*. While the astragalus and calcaneum are heavy, the length of the fourth metapodial shows the pes to have been long. The unguals have incipient hoods.

In the type specimen there are preserved the lumbar vertebræ and the sacrum. In the other specimen twenty-nine vertebræ are present, all of which are more or less mutilated. These indicate an animal of

² Notes on the Osteology and Systematic position of *Dinictis felina*, W. B. Scott. Proceedings of the Academy of Natural Sciences, Philadelphia, July 30, 1889.

great strength especially in the lumbar regions. The pelvis is broad and rugose, the ilium and ischium being thick and stout.

This species extends the range of *Dinictis*, this being the first specimen reported from the Titanotherium Beds, and is interesting as being more primitive and pointing to a greater antiquity for the genus.

MEASUREMENTS	D. fortis	D. felina
	M	M
Length of bony palate,	.075	.072
Breadth of bony palate (posterior edge)	.070	.069
Breadth between canines,	.030	.026
Length of upper molar series,	.048	.049
Breadth of upper incisor series,	.028	.029
Upper canine, transverse diameter,	.010	.008
Upper canine, fore and aft diameter,	.016	.012
Length of mandible from condyle,	.126	.119
Length of lower molar series,	.055	.052
Breadth of lower incisor series,	.015	.016
Lower canine, transverse diameter,	.004	.006
Lower canine, fore and aft diameter,	.005	.008
Humerus, length,	.192	.172
Humerus, breadth, proximal end, head and great tuberosity,	.043	.038
Humerus, breadth, distal end,	.047	.042
Radius, length,	.148	
Radius greatest diameter of head,	.020	
Radius breadth of distal end,	.030	
Ulna, length,	.191	
Ulna, distance from olecranon to beak,	.030	
Ulna, distance olecranon to coronoid,	.020	
Femur, length,		.190
Femur, breadth, proximal end (head and great trochanter)	.050	.038
Femur, breadth, distal end (greatest width of condyles)	.046	.034
Tibia, length, including maleolus,	.186	.168
Tibia, breadth proximal end,	.041	.034
Tibia, breadth distal end,	.027	.020
Calcaneum, length,	.055	.043
Astragalus, length,	.035	.027
Metatarsal IV, length,	.064	.053

***Diniotis bombifrons*, sp. nov.**

A nearly complete skull and mandible, (number 10502 in the Princeton museum) collected from the Lower Oreodon Beds by W. H. Burwell establishes a second species new to science. Unfortunately there are no other parts of the skeleton associated with it, but its size and peculiar shape are sufficiently characteristic to distinguish it at once from the species already described.

Comparing this skull with that of *D. felina*, which is the type of the genus, it is considerably larger and proportionately longer in the posterior region. At the same time it is not so high, consequently the angle of the parietals with the frontals is greater. The most striking feature is the post-orbital constriction which is situated further back of the post-orbital processes than in *D. felina* and is more pronounced, being only 31 mm. in transverse diameter. This is the concomitant of a smaller cerebral capacity. On account of the cerebral fossa being less dilated, the zygomatic processes appear more distinct and the sagittal crest is higher. The frontals are bulging and in consequence there is a median depression. This conformation would seem to indicate an enlargement of the frontal sinuses. The nasals are broad and extend behind the maxillo-frontal suture, their line of union with the frontals forming a nearly perfect semi-circle. The infra-orbital foramen is depressed well into the maxillary. The premaxillaries with the incisors are absent from the specimens and the anterior portion of the maxillaries is weathered away, leaving the fangs of the large canines exposed. The hard palate does not differ materially from that of *D. felina*. The opening of the posterior nares is broad in front but narrow further back where the pterygoids curve inward. The basal region is slightly longer in proportion, the paroccipital processes are more developed and are acute. The occipital condyles are much heavier. The foramen magnum is smaller and is nearly round. The supra-occipital is produced posteriorly so that its surface looks downward. The sagittal crest and lambdoidal ridge are thin and high. As seen from above the lateral margins of the occiput are parallel and the inion is regularly curved.

The mandible is longer, corresponding with the elongation of the skull and the flanges are low and heavy. The dentition is not essentially different from *D. felina* except in the large, compressed superior canines. The superior molar is somewhat reduced, the second inferior molar has a single root and is just on the point of disappearing, and there is a short diastema between the second and third premolars, but these characters may not prove constant. The postero-internal cusp of

the lower sectorial has been shown to be an inconstant character in the genus. In this specimen it is well developed.

MEASUREMENTS	D. bombifrons	D. felina
	M	M
Length of skull, condyles to premaxillaries,	.185	.154
Length of skull including overhanging occiput,	.205	
Length of cranium to anterior rim of orbit,	.130	.108
Length of face,	.055	.046
Distance from anterior rim of orbit to post-orbital constriction,	.065	.050
Length of bony palate,	.074	.072
Breadth of bony palate, posterior portion,	.070	.069
Breadth between canines,	.025	.026
Distance from foramen magnum to line of post-glenoid process,	.039	.033
Distance from foramen magnum to line of mastoid processes,	.0195	.0195
Length of upper molar series,	.046	.049
Length of upper canine,	.050	
Upper canine, transverse diameter,	.010	.008
Upper canine, fore and aft diameter,	.019	.012
Length of mandible from condyle,	.132	.119
Length of lower molar series,	.055	.052
Lower canine, transverse diameter,	.007	.006
Lower canine, fore and aft diameter,	.110	.008

GEO. I. ADAMS.

Geological News, PALEOZOIC.—Mr. Beecher's study of a series of *Trinucleus concentricus* Eaton, a trilobite departing widely from the common form, substantiates the conclusions of Barrande as to the generic value of the ocular tubercle and eye-line. They clearly represent adolescent characters.

In regard to the appendages of *T. concentricus*, Professors Verrill and Smith agree that they indicate an animal of burrowing habit, which probably lived in the mud of the sea-bottom, after the fashion of the modern *Limulus*. In addition to its limuloid form, the absence of eyes favors this assumption, so does the fact that many specimens have been found preserving the cast of the alimentary canal, showing that

the animal gorged itself with mud like many other sea-bottom animals. (Am. Journ. Sci., Vol. XLIX, 1895.)

The eruptive rock in south central Wisconsin, classified as quartz porphyry by the state geologists, is described in detail by Weidman. The formation represents a volcanic outflow which took place over beds of Upper Huronian quartzite. The normal rock is a quartz keratophyre, but along the contact line with the quartzite occurs a zone of sericite schist from 150 to 200 feet wide. These schists are a dynamic alteration of the quartz keratophyre, and are not as Irving supposed, related to the Magnesian schists of Devil's Lake. A third type of rock belonging to the series is volcanic breccia varying in size from an inch to a foot in diameter. The areal extent of the eruptive rock is greater than was formerly supposed. It was during an elevation which followed the outflow, that the overlying porphyry was metamorphosed, in part, into schist. (Bull. Univ. Wisc. Sci. Ser., Vol. I, 1895.)

MESOZOIC.—M. Sauvage classifies the Dinosaurs found in the Upper Jurassic beds of Boulogne from 1863 up to the present time as follows:

Sub-order Sauropoda.

Fam. *Atlantosauridæ*, *Morinosaurus typus* Svg.; *Pelorosaurus precursor* Sog. Fam. ? *Dinosaurien de grande taille.*

Sub-order Theropoda.

Fam. *Megalosauridæ*, *Megalosaurus insignis* E. E. Desl.

Sub-order Ornithopoda.

Fam. *Iguanodontidæ*. *Iguanodon prestwichii* Hulke. (Bull. Soc. Geol. de France [1894] 1895.)

Geological News.—PLISTOCENE.—A study of the topography and distribution of the typical eskers of New England brings Mr. J. B. Woodworth to the conclusion that they are most easily explained by a subglacial origin, but segments occur where the cross-section departs from the limitations of the type and demands a channel open to the sky. (Proceeds. Boston, Soc. Nat. Hist., 1894.)

Mr. R. E. Dodge offers the following hypothesis to account for the terraces of the Connecticut River:

The Connecticut River occupies such a well-marked valley that it must have been the drainage channel of a large amount of water caused by the melting of the great glacier that overlay some portion of its valley. A part if not all of the waste in the terraces must have been

lain down during the presence of the ice. Afterwards a decreased volume and a rising land will account for the rest of the work done in postglacial times. In other words, the upper terrace plain is due to a glacial accident in the river's history, and the upper escarpment was formed as the river cut down toward base-level after the land rose when relieved from the weight of ice. The later terraces formed as the river sank its channel deeper into the glacial waste, each terrace plain representing the temporary level of the stream, and each escarpment showing intermittently rising land. (Proceeds. Boston, Soc. Nat. Hist., Vol. XXVI, 1894.)

A fossil mandible in the Museum at Brisbane, Queensland, is referred by Mr. De Vis to *Zygomaturus*. In commenting on the supposed identity of this genus with *Nototherium* Owen, the author says that this mandible shows the two genera to be distinct and that *Zygomaturus*, and its three allies, *Diprotodon*, *Nototherium*, and *Euowenia*, form a natural family of the phascolomine section of the marsupials. (Proc. Roy. Soc. Queensland, Vol. XI, 1895.)

BOTANY.¹

Progress of the Botanical Survey of Nebraska.—From data recently obtained the following statement is made of the progress of the Botanical Survey of Nebraska. From its beginning, several years ago, the Survey has been a private enterprise, supported and encouraged by the University of Nebraska, the State Board of Agriculture, and the State Horticultural Society. The immediate work is in the hands of the Botanical Seminar, an organization of graduates of the botanical department of the University of Nebraska. Through the energy of the members of the Seminar expeditions have been made from time to time to nearly all parts of the State, and in some cases these have been of extended duration. The first considerable publication was made in 1890 when H. J. Webber's "Catalogue of the Flora of Nebraska" appeared in the Report of the State Board of Agriculture. Reprints of this catalogue were issued under separate cover, and these have formed the basis of subsequent work and publication. This catalogue, unlike many local publications of its kind, was based upon

¹ Edited by Prof. C. E. Bessey, University of Nebraska, Lincoln, Nebraska.